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## IS THE INCREASING CONTROL OF MAN OVER NATURE MAKING HIM INDEPENDENT OF GEOGRAPHICAL CONDITIONS?

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THIS question may seem a strange one to geographers, yet the statement that man's increasing control of nature is having the effect indicated is often repeated and even gets some recognition from avowed geographers. It has been again recalled to my mind by reading the excellent work on the geography of communications by Professor Kurt Hassert of the Commercial High School of Cologne,* where the subject is briefly but carefully handled. On page 63 of that work the author refers to the technical skill of railway engineers as gradually withdrawing man more and more from the constraint of nature, or, as he puts it more explicitly, so far as possible making the natural conditions subservient to his purposes; and he there refers us to an earlier passage of his work where he expressly points out that the progress of man can never entirely withdraw him from the constraint of nature, so that in spite of all the advances made by man the influence of the geographical conditions affecting human intercourse is always more or less apparent. And it is in a note to this passage that is found, perhaps, the most remarkable explicit statement upon the part of a geographer in support of the view hinted at in the title of this article. He quotes from Baron von Richthofen a passage in which the geography of communications is defined as concerning itself with the aims and methods of intercourse with their relations to the natural conditions of countries, but von Richthofen adds, "Whoever pursues the subject of the geography of communications in the sphere of modern civilization finds himself face to face only with exceptional conditions. Natural obstacles to communication.....have almost lost their importance; we are apt to devote ourselves to the consideration of the geography of communications of past times, or lands that are only in a minor degree opened up, but the first railway laid through these countries destroys our results, and the geography of communications in the realms of western civilization has in its main features

*_Allegemeine Verkehrsgeographie_ by Dr. Kurt Hassert, Goeschen, Berlin and Leipzig, 1913. Since this article was written, the illuminating work entitled _Industrial and Commercial Geography_ by Prof. J. Russell Smith (Henry Holt & Co., 1913,) has come into my hands, and I would refer more particularly to pp. 679-682 as supporting the general conditions of this article.

only distant relations with physical geography and becomes more and more a branch of economics."

If we find such a statement made by a geographer it is less surprising to find an even more confident statement made by a railway man. Mr. Hugo R. Meyer in criticising some of the decisions of the Interstate Commerce Commission on the ground that that Commission condemns as monstrous the railway rate practice that would be ideal, declares that "the ideal system would relieve every city from every disadvantage in the markets of other cities and would deprive all cities or places of production of all advantages resulting from their location"*—a very remarkable view for an American book, seeing that nowhere has the influence of railways been more potent in concentrating population on a few points than in America.

Such contentions as these could hardly fail to arrest my attention when I came across them, seeing that in all the editions of my *Handbook of Commercial Geography* I have contended on the contrary that in consequence of the advances in civilization "commerce and industry tend to be governed more and more by purely geographical conditions"; and I see no reason to modify this statement, except in so far as to delete the word "purely." The question here under discussion was raised and answered by Ratzel in his *Anthropogeographie,* first part, pages 63-65, and on pages 69-70 of Miss Semple's *Influences of Geographic Environment* we have her restatement and independent reinforcement of Ratzel's views in the following passage:

"Since progress in civilization involves an increasing exploitation of natural advantages and the development of closer relations between a land and its people, it is an erroneous idea that man tends to emancipate himself more and more from the control of the natural conditions forming at once the foundation and environment of his activities. On the contrary, he multiplies his dependencies upon nature; but while increasing their sum total, he diminishes the force of each. There lies the gist of the matter. As his bonds become more numerous, they become also more elastic. Civilization has lengthened his leash and padded his collar, so that it does not gall; but the leash is never slipped. The Delaware Indians depended upon the forests alone for fuel. A citizen of Pennsylvania, occupying the former Delaware tract, has the choice of wood, hard or soft coal, coke, petroleum, natural gas, or manufactured gas. Does this mean emancipation? By no means. For while fuel was a necessity to the Indians only for warmth and cooking, and incidentally for the pleasureable excitement of burning an enemy at the stake, it enters into the manufacture of almost every article that the Pennsylvanian uses in his daily life. His dependence upon nature has become more far reaching, though less conspicuous and especially less arbitrary."

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**Government Regulation of Railway Rates,* **1905, page 361.**

What suggests the idea of a man's growing independence of geographical conditions is fairly obvious. If an isthmus stands in his way between two oceans, he cuts it; if a mountain range is the obstacle he bores it, but surely geographical conditions are prominent in determining where it is most worth while to cut isthmuses and where and how tunnels may be pierced with most advantage.

In all the circumstances Richthofen's statement with regard to railways is really extraordinary, especially as coming from a geographer belonging to a country in which the Rhine valley still exercises in the railway era the same marked influence on the direction of the means of communication in western Germany as it has done throughout human history. Further, however numerous railways may be they are nowhere so numerous as roads, at least in countries of old civilization, and this would suggest that the routes for railways would be selected with even more care than the routes for roads, and no very close examination of any good map showing roads and railways is needed to show that this is the case, and that even in comparatively level countries due regard is paid in the laying of railways to the influence of the physical features. In mountainous and hilly countries this becomes at once obvious. It is true that in such countries the routes of the railways are sometimes found to vary from those of the old high roads connecting the same regions. The route of the Mont Cenis railway in piercing the Alps is not exactly that of the old Mont Cenis road. The railway from Florence to Bologna does not go as the old road did due north across the La Futa pass, but deviates northwestwards by Pistoja to the valley of the Ombrone and then northeast up that valley and down that of the Reno. But in doing so we find that geographical influences are the determining cause of the change. The old roads favored a gradual ascent over the broader part of a mountain region in order to get over the top, but railways seek routes that may take them farther into the heart of the mountains in order that where a tunnel has to be pierced the length of the tunnel may be reduced. On the borders of England and Scotland there is a peculiarly interesting illustration of such a deviation. The old roads connecting England and Scotland for the most part either went to the east of the Cheviots or to the west, but there was one much frequented road that went right across the Cheviots by way of Carter Bar, ascending on the English side the valley of the Rede and then descending on the Scottish side the valley of the Jed by Jedburgh to Roxburgh. Then again an old road goes from Carlisle through Langholm to Hawick crossing a spur of the Cheviots at a height of about 800 feet. But in modern times there is no railway by either of these routes, and the railway that connects Carlisle with Hawick follows a route which is actually more difficult than that by way of Langholm. It ascends the valley of the Liddel and rises to the height of about 1,000 feet before the Cheviots are pierced in a tunnel of about one mile in length. But on examination the reason becomes apparent

upon geographical grounds, and we find that this reason suggested by geography is confirmed by the history of the railway. The more difficult route is followed for the Carlisle-Hawick line because the same tunnel now serves to establish both that railway connection and the connection of the Tweed valley with the middle Tyne which was formerly made by way of Carter Bar. In this latter case the railway ascends to the head of the valley of the north Tyne and joins the Liddisdale railway a short distance before the entrance to the tunnel.

A little consideration, however, will enable us to see what lay behind von Richthofen's statement on the geography of railways. It is true that as soon as railways were introduced it became easier to establish important lines of communication wherever they were wanted. Important towns would thus be connected by rail whatever the character of the intervening country. These towns must have owed their importance originally to quite different conditions, in many cases to the traffic created by waterways. In these cases accordingly it must be recognized that the routes of the railways were determined in a large measure by physical conditions that no longer have the same importance, and that the influence of physical conditions on the general direction of the routes belongs to the past.

The influence of geographical conditions on modern transport is most manifest where competition is keenest, where those who know most about the means controlling nature are straining every nerve to turn every advantage to account. Professor Thorold Rogers mentions a case in which he, as a member of the House of Commons, sat on a committee appointed to consider a bill promoted for the laying of a new railway in Yorkshire, and he says, "I asked one of the landowners who wished to get the bill, why they set so much store by it, seeing that no part of the district was more than 2 1-2 miles from an existing railway and he told me, I do not doubt with perfect accuracy, that such was the competition that the difference of profit and loss on working lay in those 2 1-2 miles of haulage."*

This is a somewhat minute instance. A larger and better illustration of the influence of geographical conditions upon transport and on the importance of towns that compete for that transport is to be found in the rivalry between Philadelphia, New York, and Boston for the traffic of the west. About the beginning of last century it was Philadelphia the nearest of these towns to the west that had the largest share of that traffic, and it is well known that New York began to gain upon Philadelphia only after the opening of the Erie Canal by the easy but roundabout route connecting lake Erie with the river Hudson. Nowadays the principal railways to the west follow the same route and an examination of the traffic conditions shows that this route though the longer is the more advantageous. Boston again is at about the same direct distance as New York from Albany, from which point the chief

*_Economic Interpretation of History_ (London, 1888), pp. 230-31.

railways from these two seaports have a common route to the west. But the route from Boston to Albany is through hilly and even mountainous country involving not only much steeper gradients than those by the Hudson valley but adding considerably to the length of the route, making the railway distance by Springfield and Pittsfield to Albany 201 miles against 142 miles from New York, and the whole distance from Boston to Chicago 1037 1-2 miles against 979 from New York. The consequence is that in competition for traffic with the west Boston is altogether out of the running. On the other hand, there is keen competition between routes going by way of the Hudson-Mohawk valley and the shorter but more difficult routes that pass across the northern Appalachians. By the shortest of these routes, which actually passes through Philadelphia and then goes by Pittsburg and Fort Wayne, the distance is only 908 miles, but this is a route that involves heavy gradients, in one place a gradient of 1 in 60 for 11 miles in length. Where two such powerful railway systems are concerned as the New York Central, to which the Hudson route belongs, and the Pennsylvania railroad, which is the owner of the Fort Wayne route, we may be sure that every thing is done that can be done to take advantage of the geographical conditions afforded by each. I find on examination of a recent time table that between New York and Chicago there were nine trains per day west-bound running by the Hudson river route in less than 26 hours as against 5 by the Fort Wayne route; 7 in less than 25 hours as against 5 by the Fort Wayne route; 5 in 24 hours or less by the Hudson river route as against 3 by the Fort Wayne route, while each route managed to send one train per day in 17 hours 55 minutes. East-bound there were 8 trains running in less than 26 hours by the Hudson river route against only 4 by the Fort Wayne route; 6 in less than 25 hours by the Hudson river route; 5 in 23 hours or less against only 3 by the Fort Wayne route; and again one on each route in 17 hours 55 minutes. Here manifestly geographical advantages as determined by the shortness of the route are hardly able to neutralize the disadvantages due to the heaviness of the gradient. The one train in 17 hours 55 minutes, which is at an average rate of a little more than 52 miles per hour over the entire journey, is obviously a *tour de force* demanded by the corresponding train of the New York Central, which is run at the rate of about 57 miles per hour over all. Obviously of course Philadelphia is placed in quicker communication with Chicago than New York, but here we have another advantage telling in favor of New York even under modern conditions, namely the superiority of the New York harbor. As for other routes to the west from New York there are several that are shorter than the Hudson river route such as that which is called the Panhandle route by Philadelphia, Pittsburg, Columbus and Logansport, which is only 945 miles in length, but in which no train runs in less than 27 hours 50 minutes; the Delaware Lackawanna and Western route, 934 miles in length, but on which no train runs in less than 28 hours. In the case of Boston there is for the most part a difference of

time against that city in competition with New York of at least 2 hours, the shortest difference being 70 minutes, equal to a rate of about 50 1-2 miles an hour or the 59 miles of difference between Boston and Albany as compared with New York and Albany. It is true that there is another route to the west, what is called the Boston and Maine route passing through the Hoosac tunnel, the opening of which was so eagerly and almost despairingly looked for by the Bostonians that Oliver Wendell Holmes in his *Autocrat of the Breakfast Table* referred to this event as one of his humorous equivalents of the Greek Kalends:

When the first locomotive wheel
Rolls through the Hoosac tunnel's bore.

But this route though slightly shorter, 1033 miles against 1037 1-2, is also under the disadvantage of steeper gradients, and the train that runs in the shortest time on this route takes 25 hours as against 20 hours 20 minutes by the Boston and Albany route.

In England there was formerly an interesting illustration of the same competition based upon differences in geographical conditions in the lines running from London to Plymouth belonging to the Great Western Railway and the London & South Western Railway respectively. The Great Western route was the longer, 247 miles as against 234 by the South Western, but the Great Western route followed the valleys, whereas the South Western route to a large extent cut across the valleys involving heavier gradients, and hence it was only the advantage in distance that enabled it to maintain competitive trains with those of the Great Western system. Ultimately, however, the Great Western found a comparatively easy way of reducing its length to 226 1-2 miles, and since then it may be said that the South Western line has abandoned the competition.

These illustrations serve to dispose of Mr. Meyer's idea as to the possibility of annihilating geographical advantages and support the contention to which I have committed myself in the passage that I have cited above, a passage which, it may be mentioned, merely states more shortly what is involved in the following passage from Ratzel: "It may be set down as a rule that a great part of the advance of civilization is in the direction of a more thorough utilization of natural local endowments, and that in this sense this progress establishes more intimate relations between land and people." But something more should be added to show the nature of the misconception underlying Mr. Meyer's idea. Unquestionably a rate may in certain cases be profitable to a railway company which would not be profitable if no better rate were to be obtained from its entire traffic. But there is a limit to this. In any case only one out of many geographical factors is affected when the rate for the haulage of finished goods is eliminated, and that is what Mr. Meyer chiefly seems to have in view. These are factors which affect different industries in different ways and degrees. Some industries might be car-

ried on almost anywhere with equal advantage within a wide area. Where the industries are such as to derive great advantage from large scale production the distance from the market may be completely compensated by reduction in freight so as to make local competition on a small scale impracticable. For such industries any one of a thousand localities, say in the northeast of the United States where there is abundant labor and abundant means of communication, might be equally advantageous, but no one would think of trying to set up one of them say in Phoenix or Tucson, Arizona. This is specially true of industries for the products of which there is a widespread demand, but a demand after all so limited in quantity that a single factory or one or two factories are able to turn out all that is required, as, for example, in the case of adding machines. But with regard to the localization of industry one has to think not merely of the cost of conveyance of the finished article. The cost of the raw materials has to be considered, and surely Mr. Meyer would not contend that it can be made by railway rates a matter of complete indifference where bulky raw materials are to be found, and especially bulky raw materials of a certain kind. A very fruitful idea was put forth a few years ago in a German book relating to the localization of industries where it is pointed out that raw materials are likely to have an effect in drawing the industries to places in or near which they are found in proportion to the amount of the waste of such materials in manufacture.* He declares that raw materials which enter wholly into the finished article without any waste can have no effect in localizing the production, but where the waste is great the localizing effect is also likely to be great. It is for this reason, for example, that coal has such a strong effect in some countries in developing industries in the neighborhood of the mines, because no part of the coal enters into the finished product.

The fact that the United States, the greatest coal-producing country in the world, is far from being a conspicuous illustration under this head is interesting, and interesting, moreover, in relation to our present subject. Most of the great manufacturing towns of the United States are not on coal fields, but are great commercial centers like Chicago, Buffalo, Cincinnati, and some of the seaports, situated at spots where the geographical features have determined the convergence of great lines of communication. If Pittsburg is one illustration of the influence of coal, it has to be remembered that that is not the sole influence at work there in the development of industry. The growth of Pittsburg has been greatly promoted by the convergence of waterways, supplemented by the convergence of railways which the convergence of important waterways helped greatly in bringing about.

In connection with this we may note another consideration pertinent as a reply to Mr. Meyer's claim that it is conceivably possible for railways to render nugatory all geographical advantages. A recent economic writer

*Weber, *Ueber den Standort der Industrien*, 1909, pages 61-62.

avers* that "it is roughly true to say that nowadays it costs more to sell most articles than to make them." One of the costs of selling is the employment of commercial travellers, and it is obvious that they are most advantageously employed for the most part where multitudes of people can be reached by short journeys. It is impracticable for railways to equalize different producing centers under this head by reducing the fare for the commercial traveller in proportion to his disadvantage in competition with the travellers of rival centers. That is one reason, but only one reason why there are few manufacturing industries that I could recommend any one to try to establish in Phoenix or Tucson. Then again, as I have pointed out elsewhere, one of the costs of selling certain products, such as complicated machinery, is the necessity for maintaining and sending out experts to supervise the working of the machinery if anything goes wrong, and it would be difficult for railways to deprive a plant producing the machinery in question of the advantage it has in being easily accessible from the place where the machinery is to be set up.

But further it has to be pointed out with regard to Mr. Meyer's contention as to the possibility of destroying all geographical advantages by the manipulation of railway rates that this assumes that railway rates are competitive. The specially advantageous rates that would enable a distant place of production to compete with a neighboring place of production are generally offered in order to acquire additional traffic by taking it away from another company. If traffic can thereby be gained, however small the addition may be to the profits of the successful company it is always an addition of something worth striving for. But this state of matters tends to be brought to an end in modern conditions in more ways than one. First, one railway may succeed in acquiring complete control of the traffic by driving out the competition of the rival line altogether, and in such a case it no longer is so important for the company that is left in command of the traffic to give specially favorable rates, and once more accordingly geographical conditions would reappear as affecting the relative advantages of different places. And even when one railway is not successful in driving out the other the two railways may even find it to their advantage to come to some pooling arrangement, and in this we may be sure that geographical conditions will again appear as influencing the rates. It is such considerations as these, no doubt, that make the Interstate Commerce Commission so distrustful of railways, so unwilling to leave them to fix rates uncontrolled even on principles alleged to be ideal.

But on the question of gradients there is something more to be said. The comparisons above made were between express trains on different routes, that is to say trains of only moderate weight. Obviously the loss on the steep gradients must be much greater with heavy freight trains, giving all the greater advantage in their case to the routes with easy gradients. But here modern invention brings up another consideration, the employment of a system of elec-

*G. B. Dibblee, *The Laws of Supply and Demand*, London, 1912, p. 47.

tric traction which alliws of power being stored up when trains are going down grade, thus effecting an important economy which cannot be secured with steam drawn trains. We are informed, for example, that on the Giovi line, the line connecting Genoa with the plains of Lombardy, the recovery of power in this way "saves 17 per cent of the coal bill, and this amount is sufficient to provide for interest and sinking fund on the electrical plant at the generating station."* Manifestly this fact will assist the heavy gradients in their competition with the easier ones. Nevertheless it does not annihilate the advantage of easy grades, and even if it did we should still have to recognize geographical influences, inasmuch as heavy grades will become all the more important as factors in urging on the introduction of electric traction.

In connection with marine traffic the growing influence of geographical conditions is also observable. In the old days when leisurely voyages were made to the east once in two years the study of winds and currents was by no means so important as it became, for example, in the days of the races between British and American clippers from China to London in the early fifties of last century. The introduction of steam, while it has made navigators more independent of winds and currents has made them all the keener in the study (not necessarily the adoption) of great circle routes so as to shorten distances between ports to the utmost.

The truth is that what is tending to weaken the influence of geographical conditions at the present time is less the increasing control of man over nature than the efforts arising from what is believed to be national or state interest to thwart others in taking full advantage of favorable geographical conditions. With this in view various methods are adopted apart from protective tariffs. Canada has to some extent succeeded in deviating traffic from eastern ports of the United States by the abolition of tolls on the canals of the St. Lawrence, and it is the rivalry between the opposite sides of the United States frontier that is leading to the enormous expenditure now going on in the enlargement of the Erie Canal by the State of New York and the contemplated expenditure on the Ottawa and Georgian Bay Canal by the Dominion of Canada. It is to a sense of national interest also that we owe the preferential tariff accorded by Canada to the goods of the United Kingdom as against those from the United States and other foreign countries. But in connection with this I may conclude by pointing out that the advantage of the United States in point of geographical situation has so far counterbalanced the effect of this preference that the percentage of the imports into Canada from the United States remains as great as ever. For a fuller consideration of this case I may refer to the paper by myself, already incidentally alluded to, on The Geographical Relation of the Market to the Seats of Industry in the *Scottish Geographical Magazine* for 1910, page 180.

*Presidential address of Prof. Gisbert Kapp, Engineering Section, British Association, Birmingham Meeting (1913), *Nature*, Oct. 9, 1913, p. 187.

# THE CLIMATE OF FLORIDA IN RELATION TO THE STATE'S MOST IMPORTANT INDUSTRY

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AGRICULTURAL products, lumber, and naval stores are the chief resources of Florida. With the exception of limited areas of phosphate rock there are no minerals, neither are there fuel deposits of coal, gas, or oil; hence there is little manufacturing aside from the making of fertilizer and cigars.

The forests are being rapidly exhausted as in other parts of the United States. With their depletion lumbering and the turpentine industry will disappear leaving agriculture the state's only source of wealth.

The value of climate in the practice of farming is now well recognized. Climate, soil, and seed are the three elements which determine the size and value of a crop. It is estimated that about 40 per cent is due to climate, 40 per cent depends upon the soil, and 20 per cent is determined by the character of the seed. If these values are correct a rational knowledge of climate is as important in agriculture as an understanding of the soil.

## Peculiarities of Climate

The climate of Florida is unique among the many different types in the United States. Its peculiarities are due to, (1) the peninsular shape of the state, (2) a uniform topography, (3) proximity to an area subject to the extremes of a continental climate, (4) its position in low latitudes, (5) the influence of cyclonic storms. (1) The greater part of the state consists of a long, narrow peninsula only about 140 miles wide but projecting 400 miles into the ocean. This almost insular condition produces a very equable climate.

The latitude would indicate that it is a region of very high temperatures in the summer season but such is not the case. On the contrary many localities on the coast are favorite summer resorts for people living in the states of Louisiana, Mississippi, Alabama, and Georgia. In this southern latitude the sun's rays are almost vertical in midsummer and the heat is intensified by reflection from a sandy surface often not well covered with vegetation. But during the warmest part of the day air circulation is most active and in the shade the heat is not oppressive. The ocean absorbs large quantities of heat which maintains a lower temperature of air over the water than exists on the land. This condition causes almost constant movements of the air and whether the wind blows from the east or from the west it comes from off the sea.

The great extent of water upon the surface of the land absorbs much heat, for the state has many lakes and vast areas of swamp. Lake Okechobee in the southern part has an area of a thousand square miles and the Everglades include many thousands acres. The coolness of the nights is proverbial. When the sun sinks below the horizon in the evening the sand radiates its heat rap-

idly and the presence of large bodies of inland waters, the Atlantic ocean, and the Gulf of Mexico has a marked influence on the night temperature.

Another factor which modifies the summer heat is the frequency of precipitation. The summer season is the rainy period with showers almost every day. This so cools the air that a change of 20 degrees or more may occur in a few hours.

The ocean, like a huge thermos bottle, not only keeps Florida cool in summer but also warm in winter. Under similar conditions land heats and cools about five times as rapidly as water. The sea absorbs a great quantity of heat during the long summer and slowly radiates it in the short winter. Not only is there a long summer season for the water to absorb the heat of the sun's rays but in addition to this the east and west shores of southern Florida are near the warm Gulf Stream which brings up the heat of the tropics during the whole year. As a result of these influences killing frosts rarely occur in the southern part of the state.

(2) The climate is scarcely modified at all by topography. The southern, eastern, and western sections are level, rising gradually to an elevation which extends through the center of the peninsula from north to south and is known as the "backbone of Florida." This ridge or series of hills seldom reaches a height of 200 feet. The northern end of the state is more rolling but the hills usually do not exceed the height of those in the interior.

Florida, because of this monotonous uniformity of surface features, has a climate much less complicated than that of the state of New York, for example, with its diversified surface of mountains, valleys, plateaus, and lakes; where in some respects every locality has a climate of its own. In the summer there is a remarkably uniform distribution of heat as is shown by the August isotherms, an average of 82° to 84° prevailing in all parts of the state. In winter the January isotherms show a very gradual decrease in temperature from an average of 70° in the extreme south to 54° in the vicinity of Jacksonville. Such a uniform temperature gradient indicates that at this season latitude is the sole factor in determining the distribution of heat, the influence of topography being entirely absent.

(3) The average temperatures of the state at different seasons are:

Summer 80°, Autumn 72°, Winter 56°, Spring 70°.

This shows that the contrast in seasons is not marked. It is susceptible however to decided ranges which are here shown:

| Station | Years of record | Lowest temperature | Highest temperature |
|---|---|---|---|
| Key West | 38 | 41 | 100 |
| Jupiter | 21 | 29 | 96 |
| Ft. Myers | 17 | 24 | 94 |
| Tampa | 19 | 19 | 96 |
| Gainsville | 12 | 6 | 102 |

| | | | |
|---|---|---|---|
| Tallahasse ..... | 17 | --2 | 97 |
| Jacksonville ..... | 68 | 8 | 104 |

The central plain of North America, extending from the Arctic Ocean to Mexico, is subject to a great annual range of temperature, typical of a continental climate. The drift of high pressure areas across this region to the southeast frequently develops cold waves of great extent which bring low temperatures to the Gulf States. Florida lies upon the eastern boundary of this region and occasionally feels the icy touch of these cold blasts. Snow in measurable quantities occurs only in the extreme north of the state during long intervals of years. A snowfall of several inches was recorded in February, 1899. The frost line extends to the southern limit of the mainland, a light frost having been observed at Flamingo on December 25, 1906. Not infrequently however winters pass without severe damage even in the northern part and in the southern section this is the rule. Killing frost seldom occurs south of the 29th parallel and this region may be regarded as the semitropical section.

The effect which proximity to a region of continental climate has upon the range of temperature is strikingly shown by a comparison of Florida with California which has a equable climate of high average temperature. Though much farther north California is not subject to frequent temperature ranges of great extent. In the freeze of January 6 and 7, 1913, the temperature at San Diego fell below 32° for 12 hours, the minimum of 25° being reached on the 7th. Since 1871 the temperature has not been below 32° at San Diego and no snow has ever fallen. The limitations upon agriculture are determined largely by temperature. In some respects the farmer can modify his environment; if the soil is poor he can enrich it; if it needs water he can bring it from the mountains or distribute it over the land from artesian wells; if it has too much water he can drain it; but no means have yet been devised whereby the farmer can economically protect large areas from frost. By using the information of the weather records he can make a crop scheme to accord with the requirements of climate. Crops suitable to the locality can be selected and the time of planting and harvesting may be so regulated as to avoid the risk of injury.

A disregard for the annual range of temperature and the liability of certain sections to frost has been the cause of heavy financial loss to Florida's greatest industry. A notable instance of this lack of adjustment to climate is found in the great freeze of 1894 and 1895. For some years previous to this, land agents and industrial promoters had been booming Florida. From highly colored descriptions of the opportunities for making money in the production of citrus fruits, thousands of northern people sold their property and invested in these lands. In many cases money was borrowed at exorbitant interest rates for the purchase and equipment of the farms Houses were built, school houses and churches were constructed, and extensive areas were planted to citrus

fruits. When the trees had just reached bearing age and their owners were looking forward to great rewards from the investment of their time and money there came the killing freeze of December, 1894, in which not only was the foliage affected but north of the 29th parallel the trees were killed to the ground. Other years of widespread disaster to fruit and vegetables were January, 1886; February, 1894; February, 1895; February, 1899, and December, 1906. Authentic data indicate that other cold waves occurred in 1835 and 1857. Every plant is limited in its range by the stern law of climatic requirement and citrus fruit is no exception to the rule. It is not the fault of climate that makes such disasters possible but ignorance of adaptation. Except for these occasional temperature changes the climate of Florida is very equable, due to its oceanic surroundings and the extent of inland waters. The average temperature however is not the factor that most concerns fruit and vegetable growers. The nature of the product is such that its liability to damage by cold depends upon the degree to which temperatures may fall in extreme conditions.

(4) The variability of rainfall is in contrast with the uniformity of temperature. There are great fluctuations in the amount and distribution of precipitation. A daily fall of 8 to 10 inches sometimes occurs and the annual amount may vary from 20 to 100 inches. Drought may occur in the southern part. In summer there is usually an abundance of rain, which is tropical in character. The heavy cumulus clouds that suddenly appear do not come from any prevailing direction. When the rain begins, the cloud may seem very insignificant but it soon overspreads the whole sky and pours down a deluge of water. A peculiar feature of these storms is the absence of electrical display. While many are classed as thunderstorms by the Weather Bureau they are not severe and they do very little damage to life or property. Very often there will be no lightning at all during a very heavy downpour.

Seventy-five per cent of the precipitation occurs during the day in the form of showers which are usually followed by a clear sky in the evening. These torrential rains are caused by the convectional activities of summer, augmented from June to November by tropical disturbances moving northward from the West Indies. The number of rainy days increases as summer advances reaching a monthly average of 15 to 18 days. The number of West Indian hurricanes from 1876 to 1911 is here shown:

| Jan. | Feb. | Mch. | April. | May. | June. | July, | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 8 | 5 | 35 | 45 | 44 | 3 | 2 |

There were probably many more of a less pronounced type which served to bring up the vapor laden air of more southern latitudes.

The heavy summer rains are often erroneously attributed to the influence of the trade winds which prevail in that latitude during the period of heaviest precipitation. Extending from 25° to 31° north, Florida is alternately within the belt of trade winds and of the horse latitudes, neither of which bring rain-

fall. Although the trades come from the Atlantic they are moving from cooler to warmer regions. As the air is warmed it can hold more moisture and the elevation of Florida is not great enough to force these winds to an altitude where their vapor will be condensed. A heavy rainfall occurs on the windward side of highlands which lie in the path of the trades, while the leeward side has little precipitation. There is no marked contrast between the eastern and western coasts of Florida.

(5) The dry season extends from November to May in the central and southern parts of the state. During this period so little rain falls that irrigation is necessary for winter agriculture. This is a delightful season of clear skies, balmy days, and pleasant nights. The marked distinction of wet and dry seasons decreases from south to north where much rain falls in winter. In this section there is a maximum precipitation in July and August with a secondary period from December to March. The latter is due to the more southerly track taken at that time by cyclonic storms moving eastward from Texas. The distribution of the 81 storms that took this patch is here shown:

The number of lows on track VIII. (Russell System.)

| Jan. | Feb. | Mch. | April. | May. | June. | July, | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 13 | 8 | 7 | 6 | 3 | 1 | 3 | 2 | 5 | 9 | 13 |

## Agriculture in Florida

The mildness of Florida's winter climate and the absence of summer extremes gives it an advantage over other sections devoted to farming. Its agricultural products find no competition in the North for it raises either what cannot be grown there, or it furnishes in winter and spring what can be grown in the North only in summer. This condition establishes the supremacy of its products. California is its only rival in the eastern markets. In response to this climatic control that part of the state south of the 29th parallel has become the greatest winter trucking section in the world and its lands have scarcely yet been touched.

Early in our industrial history this peculiar type of farming was only possible in the vicinity of large cities as the perishable nature of its products required a nearby market. But today this highly specialized form of agriculture is successfully practiced more than a thousand miles from its market and the competition of the field production of winter vegetables has almost driven the greenhouse product from the market and has extended the range of our vegetable supply to twelve months in the year. Climate and soil are well known physical controls that determine the kind of agriculture practiced in a given region, but these elements acting alone are not always effective. The influence of social and economic factors are evident in this case. The growth of rapid transportation and the development of the refrigerator car have made this industry possible in Florida.

The region south of the 29th parallel is not absolutely free from destructive frosts but they are so rare that semitropical fruits and almost every variety of vegetable known to the temperate zone are produced upon a commercial scale. Oranges, grapefruit, lemons, pineapples, and less known tropical fruits grow in great abundance. The groves of citrus fruits are provided with oil heaters or piles of wood between the rows of trees to furnish heat and smoke on the approach of frost.

With an annual precipitation of more than 50 inches, irrigation is generally necessary. The greater part of the rain falls in the summer and the porosity of the soil allows it to escape rapidly. As the lowlands are better suited to vegetables than high ground the farmer is confronted with the peculiar necessity of both drainage and irrigation. Artesian wells are obtained at a depth of 100 to 500 feet and with an absolute control of the water supply a crop is almost certain. The problems of distribution are greater than those of production.

The wet summer season of high temperature is not suited to vegetable growing and this time is the trucker's vacation. To a traveller passing through the country in summer it seems almost incredible that this region of rank weeds, tall as a man, and these broad areas of grass were but a few months before a vast garden producing every kind of vegetable that grows in the United States.

As spring approaches, the center of trucking activity moves to northern Florida, which furnishes an extra early supply of vegetables to the eastern markets. The average date of the last killing frost is as follows: Jacksonville, Feb. 14; Tallahassee, March 3; Pensacola, Feb. 23; Gainsville, Feb. 20.

## Undeveloped Possibilities

The profits sometimes realized by experts in this highly specialized business are alluring but the losses are apt to be equally great. The agricultural prosperity of the state must rest upon the sound and solid basis of general farming and the production of staple crops. Climatic conditions and northern competition preclude truck farming in summer but that season is suitable for the production of hay, sugar cane, rice, sweet potatoes, and some other crops. Climate and soil are suited to the growth of many kinds of forage plants but the great possibilities of animal husbandry are yet to be realized. Sugar cane is perhaps the most profitable crop to which the country is adapted. Cane growth requires a low, well drained, rich land such as is found in reclaimed cypress swamps and saw grass marshes. An average temperature of 70° and an annual precipitation of 60 inches, (about 45 inches of which should fall during the growing season) are the most favorable climatic conditions. Western, northern, and central Florida has full 30 days longer growing season than Louisiana, and the southern section can add 45 to 60 days. Sugar cane is a tropical plant and attains full maturity only in regions free from frost. South

of the 27th parallel is the only part of the United States where it forms its seed annually.

When the great engineering project of draining the Everglades is finished vast areas of rich land in large bodies can be had. Where the acreage is large the plantation system can be used. The planter can operate his own mill for grinding the cane, which he raises.

Climate, soil, and economic advantages should make Florida the greatest center of sugar production in this country. Before the Civil War large sugar plantations flourished in several southern counties in the state. The ruins of old sugar mills, almost buried in the dense growth of bushes and young trees, are still to be seen; they stand as the ghosts of a vanished industry. Under the changed economic conditions following the war, the sugar plantation gave way to the orange grove and truck farm. The reclamation of swamp and marsh will provide a vast territory suitable for the cultivation of sugar, rice, and other tropical products.

## Summary

Florida presents a distinct type of climate.

(1) The peninsular shape of the state brings it under the influence of the sea on three sides. As a result there is no great contrast between the average temperature of summer and winter. The climate is equable.

(2) A uniform topography produces simple climatic conditions, there being no violent contracts in restricted areas.

(3) The low latitude gives the state a high average temperature. It also brings it within the influence of tropical cyclones which cause very heavy rainfall in late summer. The belt of horse latitudes covers it in winter and clear skies with little precipitation are the result.

(4) The northern part has a secondary period of heavy rainfall from December to March, caused by the more southerly track taken by cyclones moving eastward across the United States.

(5) The state is close to a region with a continental climate. Cold waves are liable to produce a wide range of temperature which sometimes causes destructive frosts, especially in the northern part.

Agriculture in Florida is a response to climatic conditions. Some of its products are tropical. The high temperature and dry weather of winter make it an important trucking and fruit growing region. The liability of frost in the north confines this business to the early spring in that locality.

All parts of the state are suitable for the production of staple crops such as sugar cane, corn, rice, forage, plants, hay and sweet potatoes. The drainage of large swamp areas will add an immense acreage to the farm lands that are adapted to these crops, and agriculture will continue to be the state's most important industry.

# INDUSTRIES AS STUDIES FOR HIGH SCHOOL PUPILS IN A COMMERCIAL GEOGRAPHY COURSE

By SUMNER W. CUSHING,
Salem (Mass.) Normal School

IT is generally admitted that the field of commercial geography is so large and varied that it is quite beyond the intelligent comprehension of the average high school pupil, unless he has had actual contact with the basic elements of the science, that is, has observed consciously the home phases of commerce and industry. Now this is something the ordinary pupil cannot do by himself. He has been brought up amid the same surroundings that are now his and they appeal to him as commonplace, without meaning, and quite unworthy of his serious attention. If he had just reached this land from the Orient, it would be quite a different matter, so vivid would be the contrasts that they could not escape him. He would instinctively seek the reasons for such unlike conditions and so would gain valuable items of our science.

Two years ago I stepped into the Orient at Alexandria, Egypt, from the deck of a Mediterranean steamer, and was overwhelmed by the scenes, the color, the people, and the noises of a new world, in spite of having read of the East all my life. A few months later the veil of the commonplace had been so drawn over it all that scantily clothed natives in gaudy colors, luxuriant palms, and abnormally high temperatures were hardly noticed. My experience was paralleled by a British official at Cairo, who told me he felt he could write a book on that city after he had been there a week; at the end of the first year he was sure he could write interestingly no more than a newspaper article; at the end of eight years he returned to London and was nonpulsed when called upon by a Sunday school superintendent to tell the class something entertaining concerning Cairo. So it is to a greater extent with our pupils. They feel the interesting things of commercial geography are far removed, whereas they are right at the door and only need someone to reveal them.

Therefore, it seems to be the duty of every teacher of commercial geography first to systematically acquaint his pupils with the industry and commerce of their own city or town, that they may have a basis for interpreting similar and contrasting conditions in distant regions which they cannot readily visit.

Now of the four fields of commercial geography—primary production, transportation, manufacturing or industries, and the final consumption of the commodities—industries seem to lend themselves best as a central study about which all the others may be grouped. I should like to point out a number of reasons why I believe industries are best adapted to form the heart of a course in commercial geography for a New England high school.

First, they are so readily available. In all probability every town that is large enough to include commercial geography in the high school curriculum has at least one industry that is worthy of extended study. Our group of

states is so largely industrial that practically every center of population has within easy reach a number of large, characteristic industries; in fact, the development of industries is the usual cause for the growth of our villages into cities. For instance, in Salem we have four large industries, each one of which can be readily reached, studied, and the return trip made to the school in less than three hours. They consist of a cotton mill, tannery, shoe factory, and a foundry. In half day excursions the General Electric Company, at Lynn, the United Shoe Machinery Company, at Beverly, the Danvers Bleachery, and the A. C. Lawrence Leather Company at Peabody can be visited.

Second, industries form clear cut units within a very limited space and nearly all their processes can be readily observed within a brief time; whereas an occupation of primary production like agriculture can be properly observed only in an extended trip over the farm and requires many visits at different seasons. In referring to these difficulties I do not mean to suggest that primary production does not deserve studying at first hand, but merely that the manufacturing industries in New England better serve our purpose in forming the introduction and central theme of our course.

Third, there is a fascinating throb about them that early gets the interest of the pupil and holds it to the very end of the study. I believe this is not confined to young folk. Mature people with any imagination at all feel the irresistible charm of a complicated machine in action, while they watch it turn out a product with such rapidity, force, precision, and perfection that many expert men would be required to equal it.

All possible local industries should be studied; if for no other reason than to give the pupil an appreciation of the possibilities that lie before him, when he makes his selection of a life occupation. No caste system has to be followed in this country. Free choice of an occupation is every person's right. This is of little advantage, however, unless something is known of the various possibile occupations in a community. Moreover in such a study a fine opportunity is offered to point out the necessity of work for the good of all, and a sympathetic understanding of the conditions under which men work.

The study of industries has much of high value to offer the high school pupil. In these days every industry that survives does so because it has high efficiency—efficiency in the individual worker, efficiency in every gang, efficiency in every department. So the study of an industry should be a great lesson in efficiency—something that is of highest worth to the plastic American youth who is learning the lesson of waste too often in his own home, in the school, and about the city.

I have already suggested that industries serve well as centres from which pupils may reach out to all the other fields of commercial geography. May I illustrate the thought concretely? Let me first present a plan for the study of an industry, then indicate something of the way it works out.

SCHEME FOR STUDYING AN INDUSTRY

*Raw materials* (including, besides what is usually understood by the term, those that are slowly consumed, such as fuel, machinery, labor, buildings, etc.)
- Geographical source
- Natural source
- Means of transportation

*Processes*
- Names
- Need of each

*Finished products*
- Kinds
- Economic needs met
- Where consumed
- Means of transportation

*By-products*
- Kinds
- From what processes
- How utilized

*Locational factors*
- Number
- Relative importance

*Variations* in this industry elsewhere

This plan with ample space to take notes under each heading is organized in the pupil's notebook before he starts out from school. He further understands that he is to take notes on the spot without direction. There are so many items that the memory could not hold them accurately, and the noise of machinery usually prevents the giving of directions by the teacher.

For many days following a visit to an industry the outside work consists of research among the technical books of commercial geography (sometimes referred to as text-books, but in this course used in no such way), magazines, encyclopedias, maps, etc., and the class room discussion deals with material gathered both from the industry and the reading. The final report from each pupil is in the form of a graphic representation of the industry. That is, on a large sheet of paper the sources of each of the raw materials are listed at the extreme left and the final destination of the finished products at the right. Between the two lists is placed a diagram of the industry in which is shown the growth of the raw materials under certain conditions of soil, temperature, and rainfall, their movement to the place of manufacture along lines that symbolize various means of transportation, then their progress through the processes to the finished products; and lastly the geographical distribution of the products along various transportation lines to cities, to other industries, to stores, and finally to people, to meet the demand that set all of these agencies

of the modern industrial world in motion. Many diagrams show also, in appropriate places, contributory industries, locational factors, by-products and dependent industries.

A few samples of the multitude of problems that evolve from these trips may be suggestive.

A visit to the Danvers Bleachery reveals the fact that much of the coarse cloth bleached comes from North and South Carolina mills; a point that suggests that their rivers without filtering ponds and lakes are too dirty for washing cloth, whereas glaciated New England abounds in such features with the consequent clear river waters. The coarseness of the southern cotton, as compared with the northern, is discovered by the pupils as they handle both, and the difference calls for an explanation. Differences in temperature, humidity, class of labor, and age of the industry are some of the reasons put forward.

A class visit to the United Shoe Machinery Company at Beverly reveals the fact that they use Lake Superior iron smelted into pigs at Pittsburg; that they mix this with much scrap steel, gathered locally, to make the machine standards; that they import tool steel from Sheffield, England, and from Sweden; that they export quantities of their products to Buenos Ayres, Sydney, Cape Town, and other new industrial centres, as well as to the numerous older ones. Each of these items is highly significant and typical.

A study of the A. C. Lawrence tannery shows that almost the entire world is being drawn upon to supply it with skins. At this moment hunters are in the Andes searching for wild goats that their skins may help supply the necessary raw material; for the same purpose shepherds in Australia are killing their sheep, ranchmen of Argentina are sacrificing their cattle, moslems of India are skinning their bullocks, and many wild animals of Africa are being hunted to the same end. Today skins from all these sections and many more are being hastened on their way to the A. C. Lawrence tannery by every means of transportation, from the coolie porters of India and the wheelbarrow of China, to the speedy auto-truck and the giant ocean liner. Today the finished product of this tannery—leathers of all kinds and grades—and the innumerable articles into which leather is made, are being sent to all parts of the civilized world to meet the needs of humanity. Now of course this information is not new, it can be readily found in books, but the great advantage lies in the fact that the pupil, while at the tannery actually sees the hides and skins coming in, or in the store house with tags indicating their starting point; while surrounded by the industry he gathers first hand knowledge from the foreman concerning the meaning and need of the processes; and in the shipping room from the destination addresses, he realizes how the industry reaches

out to a hundred others and to the ends of the world. Knowledge gained in this way is of the solid kind. It is so impressively gathered that it remains with one to be used without limit and may serve as the basis for interpreting and illuminating much of his reading.

Liberal education has been defined as the development of an appreciation of the great modern world about us. If we accept this thought, then commercial geography becomes the greatest liberalizing study of the commercial course, and industries the foremost element, since the modern industry makes possible modern society. Modern society might well adopt the machine as its emblem,—its coat of arms. It is for us, as teachers of commercial geography, to present the key of the modern world to our pupils, as it were, by leading them through the study of a series of representative industries, not by books, but by presenting the industries themselves while they are pulsating with vitality.

## AN EXCURSION TO THE ILLINOIS STEEL MILLS, MILWAUKEE

By LOUISE W. MEARS,
Milwaukee State Normal School

CLOSE observation of an industry and the organization of these observations are two different processes for the pupil to perform in connection with an industrial excursion. When a great manufacturing plant is to be visited, the pupil needs a few good topics under which to group the complicated data. While interest stimulates observation, it does not necessarily result in organization of facts. There are two distinct reasons, it would seem, why a pupil should be equipped with a good outline of an industry, this outline to be self-made for the simpler processes. He needs organized material for future use, and he needs the habit of organizing his observations.

A geography class of sixty juniors in the Milwaukee Normal School received permission to visit at night the great Illinois Steel Rolling Mills, a privilege not accorded, on account of risks, in a number of years. An outline similar to the following was used to guide the pupils in their observations. Not all of the information suggested could be obtained, and some facts only approximately.

ILLINOIS STEEL WORKS (Bay View) Milwaukee.
(Excursion Jan. 23, 1913.)

I. Plant
   1. Location
   2. Ownership
   3. Work done
   3. Size—Building, Output (Capacity).

II. Raw Products
   1. Source

2. Transportation
3. Cost
4. Manufacture—Products
5. Fuel

III. Processes
1. For each product
2. Exportation
Markets—Domestic, Foreign
3. Transportation

IV. Labor
1. Machines
2. Human
Number
Nationality
Wages—Day, Tonnage
Degrees of Skill—Foreman, Laborers, etc.

V. By-products

VI. General Welfare
1. Inspection
2. Safety appliances
3. Opportunities for investment of wages

A visit to the Illinois Steel Works by night is no small experience. Miles away one sees the heavens made lurid, and the lake water-front seeths with the dumpage of fiery slag.

The iron ore as a raw product comes from the Lake Superior region by water and by rail. It lies mountain-high in the yards of the steel plant. The manufacture begins with the making of pig iron. (The process is admirably described in Stories of Industries, such as Rocheleau's). Steel is not manufactured at Milwaukee. For economic reasons the pig iron is sent by rail to the steel works at South Chicago and Gary, Indiana, where there is the equipment for refining iron. As steel it is then returned to the Milwaukee Rolling Mills to be manufactured into such products as wagon tires, rods, tie-plate (to protect wooden ties, used on the Chicago, Burlington and Quincy Railroad), ribbons for pipes, and the "Havemeyer bar" for re-inforcing concrete structures.

The term *rolling mills* speaks for itself when one observes the method by which the steel passes over roller after roller until the final product is attained. A fiery steel billet, 4 feet by 6 inches in dimensions, comes out a ribbon measuring 102 feet in length, to be used as a steel re-inforcement for concrete. Another billet comes out as a five-eighths rod.

In passing from roller to roller the red steel is serpentine in its movements. When the tongs of the workmen seize it to direct its course from one roller to the next, it writhes in fiery loops as if animate. It finally shoots like

lightning along the floor from the last roller, and is moved laterally over moving rods to the trough that carries it away. The tongs are cooled in tanks of water, and water is kept running over the rollers to prevent expansion.

A labor-saving device is the cradle for lifting the steel. An enormous magnet is used for picking up the steel billets and loading them on the cars.

The visitor to the Rolling Mills ascends a narrow steel platform which extends across the middle of the great building, and from this vantage point he can observe the entire interior. It is a safety device. Sixty students standing upon the platform could see the entire process involved in the making of each product.

The safety devices are interesting and everywhere suggest the effort made to protect human life. As a precaution against explosion there are furnace doors that will open when the pressure becomes abnormal. A permanent safety inspector is employed, and more than $10,000 have been expended for safety devices. Each emery wheel has a glass covering to protect the eyes of the workmen.

As to labor, there are from twelve to fourteen hundred men employed—Poles, Slovaks, Greeks, Italians and Englishmen, receiving pay as "day men" and "tonnage men." There are opportunities for promotion and for investment of wages in the company.

A by-product is the gas which heats the blast and runs the engine.

This excursion to the steel works was preceded in the class-room by study of iron mining in the Superior region, with lantern slides to illustrate mining, dockage and transportation. Each pupil made a good diagramatic sketch of a blast furnace. In the laboratory the pupils studied the Underwood series of photographs on pig iron with the stereoscope.

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## GEOGRAPHICAL INSTRUCTION IN GERMANY*

By DR. JOSEPH PARTSCH,
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SIXTY years ago, when the American Geographical Society was founded, Aleaxnder v. Humboldt and Karl Ritter were the leaders of geographical science. But the vigor of their ideas was not supported by a universal homogenous geographical teaching in the highest schools of Germany. Only forty years ago geography began to be acknowledged an indis-

pensable branch of academic instruction. It was a fortunate occurrence that the German governments in choosing within a few years many professors of geography were not confined to scientific men who had been educated only in the home county. Ferdinand v. Richthofen, the explorer of China, accepted a professorship of geography and, going round through three great universities, had a decisive influence upon the development of geographical teaching. From North America Frederic Ratzel's noble mind brought the sense of wide areas and the lofty flight of keen ideas. Later on, the German colonies gave to young geographers the opportunity of a rich scientific harvest.

Notwithstanding this divergence of their original studies the geographers at the universities of Germany generally agreed about the main questions concerning their duties. Methodical discussions and personal meetings at the German Geographical Congress, held every second year, contributed a good deal to the establishing of a unity of opinion about the methods to be followed. This unity assured the general confidence of the scientific world and of the governments in the value of geographical teaching in the universities. Now in the German Empire no university exists without a chair of geography, and even some of the technical and commercial high schools as well as the colonial institute in Hamburg have special geographical teaching. Today 29 professors appointed by the states or a municipality are in active service, assisted by 15 instructors of geography.

The principal goal of the university instruction is to prepare teachers for the secondary and normal schools by a series of lectures accomplished in a period of three or four years, and by manifold practical and theoretical exercises. University instruction in geography has developed in these forty years extensively and has surpassed, as I think, the success of the preceding generation, which had only three or four chairs of geography in the whole extent of what now is the German Empire. If we succeed in improving the geographical instruction, that is no merit. We would be poor scholars, if we had not gone farther than our teachers. And we are aware that very much remains to be done by the next generation.

The governments have assisted the progress by a more perfect equipment of the geographical institutes. The revenues of these institutes vary greatly. Berlin, of course, is in a singularly favored position, not only because of the ample financial resources of the seminary of geography installed in very large rooms, but also because of the intimate connection of this seminary with the oceanographic institute, fitted out with a considerable library, highly developed physical, biological, economic and nautical collections and a staff of scientific men, among whom is a cartographer. The other institutes also differ widely in their equipment. Among them

***Third paper in the series on Geography in Europe. This and the preceding papers of the series were presented at the conference at Charlottesville (Univ. of Virginia) in October, 1912.**

the universities of Munich, Leipzig, Gottingen, have the largest budget for geographical teaching. Everywhere there is an endeavor to develop three departments: (1) A collection of instruments of observation, of cartometry and of drawing for the training of students; (2) A collection of maps and reliefs, pictures and lantern-slides; (3) A library of text-books, journals and the most important reports of exploration. Time has, of course, contributed to the growth of these collections. Not only have the means increased, but the methods of using them have also improved.

In two ways especially progress has been made; first in the practical and theoretical exercises where the students are trained in different branches of scientific work. These exercises are somewhat differently organized according to the individuality of the teachers. But everywhere, I suppose, the use of geodetic and meteorological instruments, the reading of topographical and geological maps, the principles of surveying and of drawing maps in different projections and in different methods of showing relief are taught. Mathematical geography is illustrated by means of models showing the astronomical relations of the earth and sun. The theoretical instruction is carried on by reading classical geographical works, by the discussion of problems and of new publications of importance, by criticisms of papers or lectures prepared by the students. I would not fail to mention that the splendid morphogenetic atlas of Professor Davis is also used with great success as a subject of seminary discussions. Besides these exercises arranged for a large body of the students, the advice given to individual students for their special studies or in the preparation of their theses claims a great deal of attention on the part of the teachers.

A second point, not less important, is the introduction of field work in the plan of instruction. Longer and shorter scientific excursions increase the acquaintance of the students with morphology in general and especially with the features of their country. Thanks to special grants of the governments or the munificence of men of keen insight and ample means even farther regions, the Alps, the Carpathians, the shores of the sea are within the reach of our desire.

What we now enjoy in this journey through the United States, on the grandest scale and under ideal conditions, the enlarging of the horizon and of scientific experience that is indispensable is needed in a more modest proportion for the preparation of young teachers of geography. The years passed by our boys in the schools are long and not in every respect favorable for the development of the powers of observation. The young men must be trained to use their eyes and learn to understand what they see. Over the door of the geological building of Columbia University we read the sentence, "*Speak to the Earth and it will teach thee.*" These words should be also the motto of every seminary of geography. Everyone who had the experience knows how important are scientific excursions not only for the training of the students, but also for awakening the enthusiasm of young men for geographical studies

and geographical teaching. The best way to love the home country is to know it well. In fulfilling this duty for himself and for his scholars the geographical teacher achieves a very important task in national education.

## RECENT PUBLICATIONS

PRINCIPLES AND METHODS OF TEACHING GEOGRAPHY. By Frederick L. Holtz. XII+359 pages. 33 figures. The Macmillan Co., 1913. $1.10.

This new book on geographic methods is an excellent summary of the ideas generally accepted and adopted by the more progressive teachers of the subject. A sense of disappointment will probably be felt by such teachers, however, upon reading the book as little that is new either in the way of method, of suggestion or of lines of future progress has been included. But for the teacher in training for whom the book is in part designed, a safe and sane line of procedure is outlined and a fund of valuable guiding principles has been collected. Because of the simple style and in many chapters the absence of disquisitive methods of presentation the book would be of great service to geography teaching if it reached the desk of many of the teachers who have gone into the work without special preparation. The chapter on mathematical geography, a topic which too frequently is presented to children without much consideration of the pupil's ability, illustrates this point.

The book follows the order of presentation of subject matter in the grade schools beginning with home geography and discussing in turn physical, mathematical, political, and commercial geography. A few chapters on special features as the use of the text book, the casual relation, supplementary reading and maps are included. Three chapters near the end of the volume, The Evolution of Geographic Knowledge, The History of the Science of Geography and Some American Text-books of Geography furnish an excellent background for historical research but they seem to the reviewer out of place in this book. The closing chapter gives a list of geographical references which is slightly marred by a carelessness in quoting titles of books.

ROBERT M. BROWN.

INDUSTRIAL AND COMMERCIAL GEOGRAPHY. By J. Russell Smith, XI+914 pages, 5½ by 8½. Henry Holt and Co. 1913. $3.50.

Prof. Smith divided his work into two parts as indicated in the title. The first part, Industrial Geography, comprises the greater portion of the volume,—640 pages out of a total of 903. The unit of study, so far as arrangement is concerned, is the industry or group of industries. He begins with agricultural and ends with the manufacturing industries, and attempts to show in every case how the nature-factors are influential in determining location. He follows this with a description of the industry as found in the United States and the conditions under which it is carried on; then he takes up the development of the industry in foreign countries.

The second part, COMMERCIAL GEOGRAPHY, is devoted to a systematic study of the commerce of the world. A great part of the material found here is contained in Prof. Smith's earlier work,—"The Ocean Carrier." Special emphasis is placed upon the important trade routes of the world and the products entering into international trade.

This work is received with great eagerness by the teacher who is conducting courses in commercial or economic geography. Up to the present it has been extremely difficult to find a text book adequate to meet the needs of students in the commerce courses of our Universities. Prof. Smith, teaching in the Wharton School of Commerce in the University of Pennsylvania, felt this demand and has succeeded in writing a text which meets the needs of commerce students most satisfactorily.

To the person who is interested more in geography than in the economic development, Prof. Smith's work may not appear to be an adequate treatment of the subject because geographical influences are not accorded prime importance. The economist feels that the geographical influences receive all the emphasis they deserve in a treatment of this kind. In fact, the reviewer would like to see more attention paid to the economic aspects of the industrial development of the United States; the author might have devoted more space to the question of the extension of the markets, to tariffs, and to industrial organization.

This book is to be commended not only as a text-book for college and university classes, but can be used as a reference work by teachers of commercial geography in high schools. The man of business and the general reader will also find this work one of unusual interest. In every case the statistics are brought right up to date; the book was written after the 1910 census figures were available. At the end of each chapter is found a well selected list of references; the book is also supplied with a good index which makes it all the more valuable as a work of reference.

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## LABORATORY MAP EXERCISE ON THE WORLD AS A WHOLE

[*Based upon Rand McNally & Co.'s Physical Wall Map of the World, Mercator's Projection*].

1. Locate on the map (1) the Equator, (2) The Tropic of Cancer, (3) the Tropic of Capricorn. How many degrees from the Equator to either Tropic? Why this number of degrees?

2. Locate the northern boundary of the North Temperate zone; the southern boundary of the South Temperate zone. How wide are these zones? Why?

3. The Mercator's map greatly exaggerates the width of both land masses and water bodies in the northern and southern portions of the map;

for example, northern North America appears to be very much wider than it really is. Explain why.

4. In reality, South America is nearly as wide as North America. Why does it appear much narrower on this map?

5. Compare Cape Horn and the Cape of Good Hope with respect to latitude. What important city of South America is in about the same latitude as the Cape of Good Hope?

6. In what zones does Australia lie? Norway?

7. What parts of the Old World lie in about the same latitude as the United States?

8. Why are the isotherms of the northern hemisphere so much more irregular than those of the southern?

9. Locate the isotherm for January 30°, that is, the line connecting places whose average mid-winter temperature is about freezing. Why does this isotherm bend so far north in the Atlantic Ocean?

10. Note that Washington, D. C., is as cool in January as the southeastern coast of Iceland, and that southern Norway is as warm in January as southern Russia. Explain.

11. The isotherms indicate that it is warmer in South Africa in January than in July. Explain.

12. Why do the equatorial ocean currents all move toward the west?

13. Why do the principal ocean currents of the North Temperate zone move toward the east and northeast?

14. Why are west-facing coasts in the North Temperate zone warmer in winter than east-facing coasts?

15. It is noticeable that a much larger number of the principal rivers of the world flow into the Atlantic than into the Pacific. What is the reason?

16. Note that the symbols indicate cold water rising to the surface of the sea along the west coasts of both Africa and South America. Why on the west coasts rather than on the east?

17. In the West Indies and Central America there is heavy rainfall in the same latitudes that include the great desert of Africa. Explain.

18. The isotherm for July 60° extends nearly north and south on the west coast of North America for more than a thousand miles. What does this signify and how is it explained?

19. Why is Norway warmer than Alaska in the same latitude?

20. Since Cape Horn is farther south than Buenos Aires, why is the climate not warmer?

## THE SEA CAVES AT LA JOLLA, CALIFORNIA

One of the best places in the United States to study the work of waves and tides is at La Jolla, California, a suburb of the city of San Diego. Here the coast is honey-combed with caves and chasms through which the sea enters in tortuous channels, carving the rocks into the most fantastic shapes.

FIGURE 1

The caves for which La Jolla is noted are numerous and show some variation in size, architectural design, etc., but most of them are typical of their kind, with nearly horizontal floors and entrances all on the same level, [see Fig. 1.]. The rock layers are in horizontal and parallel planes, clearly showing the successive elevation of the land.

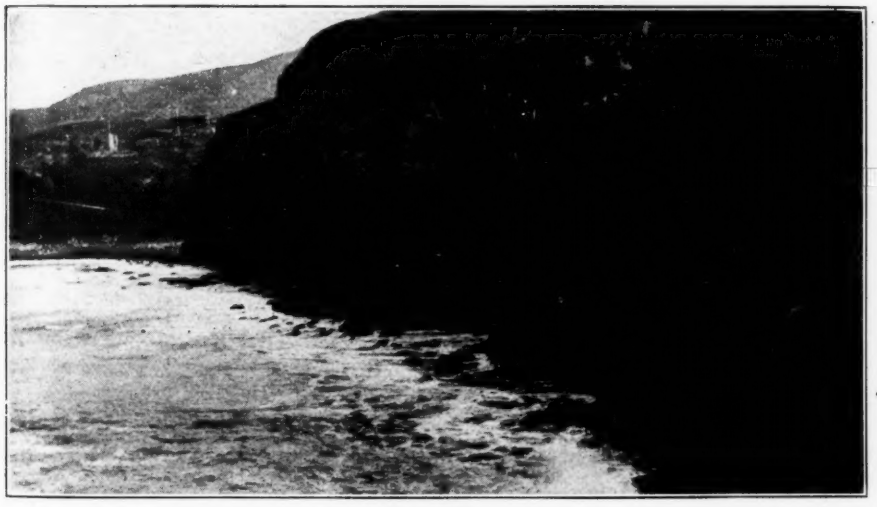


FIGURE 2

The horizontal cleavage of the rock layers is very marked along the entire coast in the immediate vicinity of the caves; this favors the formation of arches, natural bridges, etc.

The cliff out of which the caves are carved is high and precipitous, and rises nearly two hundred feet above the level of the water at low tide. It is composed of layers of sandstone [arenaceous], shale, mudstone, and conglomerate sandstone of varying width, the sandstone predominating. The fragments in the conglomerate vary in size from one inch or less, to several feet in diameter; the larger ones project out from the cliff and present a rather odd appearance. A more detailed view of the projections may be seen in Fig. 2, which shows the effect of water erosion between high and low water level. The shales and mudstones are fossiliferous, most of the fossils, however, have been washed out by the waves. In places the shales are much contorted.

The caves proper consist of a series of spacious, vaulted chambers and passages, many of which are connected, though few of the latter are wide enough to allow a person to squeeze through. Many of these narrow, tortuous passageways are touched by the waves only at very high tide.

At low tide a sure-footed individual can readily gain access to several of the caves from the ocean side. Once inside one notes the successive reaches of the waves and tides on the walls of the chambers. The rock strata are much the same as described in a preceding paragraph, the conglomerate sandstone predominating, giving to the whole a rather dull grayish-yellow tone; occasional streaks of blue and tinges of red indicate the presence of copper and iron. Except where portions of the roof or walls have fallen in, the daylight enters the caves exclusively from the entrances on the ocean side. When the chambers are illuminated by the rays of the setting sun, the effect is wierd and beautiful.

The floors of these sea caves are almost entirely free from sand and shingle, for only the huge boulders seem able to withstand the attack of the waves which enter at every high tide. Potholes, large and small, are very much in evidence; the diameter of these holes depends on the size of the pebble or stone that has been loosened from the softer matrix of the parent rock, which in this case is a sandstone conglomerate.

Sea plants and mollusks are present and aid in the work of destruction, especially active is the rough piddock, *Zirphaea crispata,* which tunnels the rock through and through.

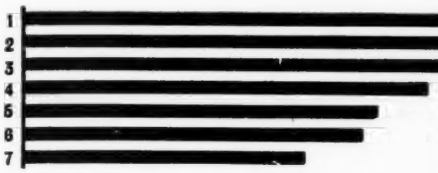
HULDAH L. WINSTED.

## BLACKBOARD MAPS

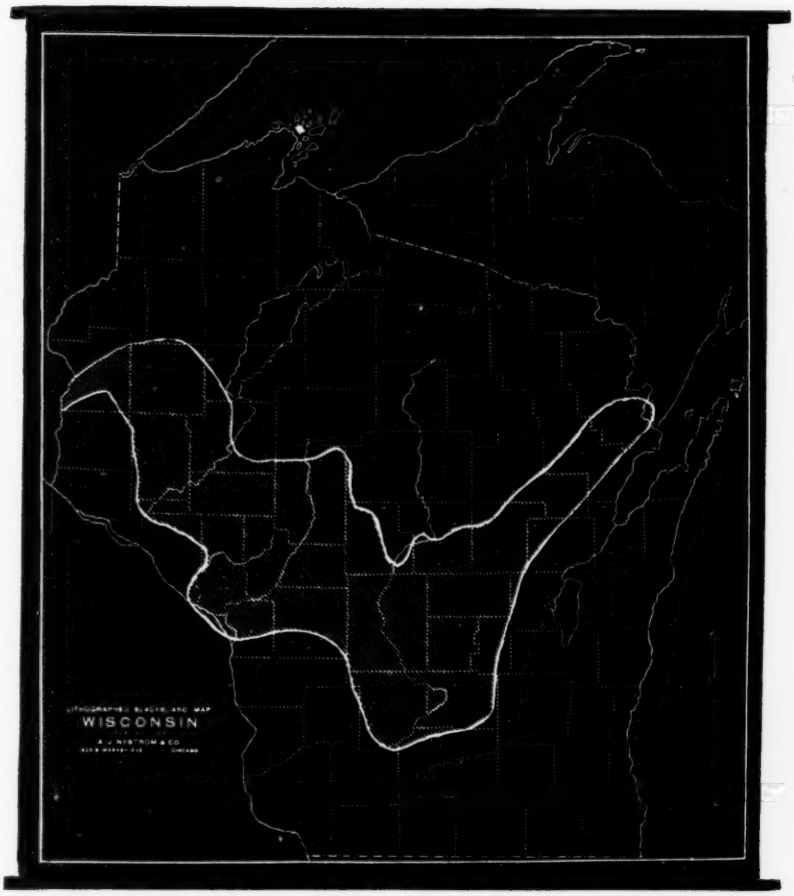
L. P. Denoyer, La Crosse Normal School. (On leave of absence, 1913-14)

IN a recent article appearing in this journal emphasis was laid upon the importance of underlying rock in the production of agricultural products. The following is intended to emphasize this point a little further in connection with two products in which Wisconsin ranks relatively high.

The following graph shows the seven leading counties in the production of potatoes in 1911.



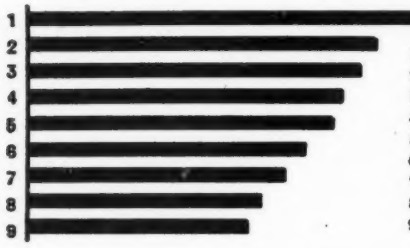

1. Portage..... 2,507,376 bu.
2. Waupaca..... 2,392,213 "
3. Waushara..... 2,255,887 "
4. Columbia..... 1,350,775 "
5. Sauk..... 1,226,376 "
6. Barron..... 1,194,012 "
7. Chippewa..... 943,381 "




The map above roughly shows the position of the Potsdam sandstone belt of Wisconsin.

It is of interest to note that each of these counties lies either wholly or in large part within the sandstone belt. Juneau, Eau Claire, Marquette and other counties of this belt are also large producers of potatoes.

The following graph shows the production of rye in the same year.

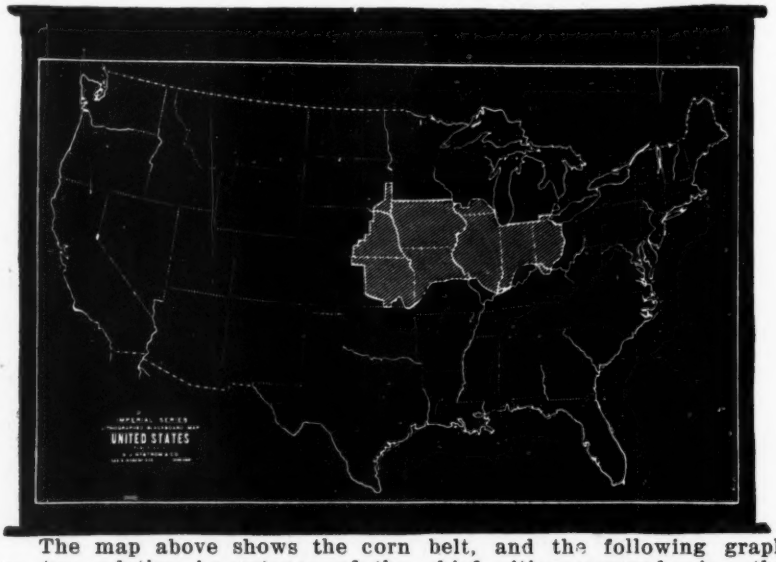



1. Pierce Co.....522,742 bu.
2. Waushara Co.....231,430 "
3. Manitowoc Co.....228,065 "
4. Portage Co. .....222,333 "
5. St. Croix Co.....218,389 "
6. Marquette Co.....187,887 "
7. Adams Co.....172,498 "
8. Brown Co.....169,765 "
9. Columbia Co. .....141,199 "

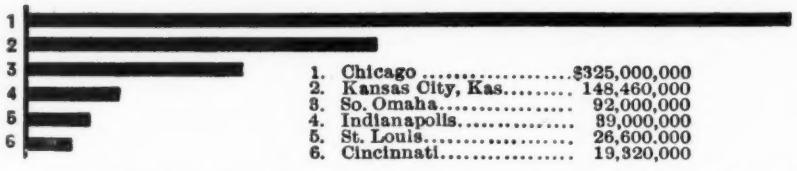
With the exception of Pierce, St. Croix and Manitowoc (which have large sand areas), these counties also lie within the sandstone belt.

This belt would not, however, stand high in the production of wheat, barley, or oats.

Geography seeks to explain the distribution of life and industries. Here we see the relation between certain products and the underlying rock.




The map above shows the corn belt, and the following graph shows the relative importance of the chief cities engaged in the slaughtering industry. Note that they are all within the corn belt.




1. Chicago .....$325,000,000
2. Kansas City, Kas..... 148,460,000
3. So. Omaha..... 92,000,000
4. Indianapolis..... 39,000,000
5. St. Louis..... 26,600,000
6. Cincinnati..... 19,320,000

The above are two illustrations taken from the 24-page booklet prepared by the writer and his colleague, Prof. A. H. Sanford of the department of history. The booklet may be had free by addressing the publishers, A. J. Nystrom & Co., 623 S. Wabash Ave., Chicago.